

What is Claimed is:

1 1. A system for sensing and compensating for at least one error signal, the system
2 comprising:
3 an acoustic pick-up device having a first microphone disposed at a first distance
4 from a desired acoustic source, and a second microphone disposed at a
5 second distance from the desired acoustic source, each of the first
6 microphone and the second microphone
7 receiving acoustic signals generated from the desired acoustic source, and
8 in response, transducing the acoustic signals into audio signals;
9 a position estimation circuit coupled to receive the audio signals from the first
10 microphone and the second microphone, and adapted to produce therefrom
11 the error signal representing an estimate of the acoustic pick-up device being
12 positioned differently than intended with respect to the desired acoustic
13 source, the position estimation circuit including a first circuit providing an
14 average of corresponding magnitudes for the audio signals received from the
15 first microphone and the second microphone to produce the error signal; and
16 a controller using the error signal to compensate for the acoustic pick-up device
17 being positioned differently than intended by providing the audio signals
18 from at least one of the first microphone and the second microphone to an
19 output.

1 2. The system according to Claim 1, wherein the first circuit comprises a first
2 absolute value detector coupled to a first envelope detector, and a second absolute value
3 detector coupled to a second envelope detector, the first absolute value detector receiving
4 the audio signals from the first microphone, and the second absolute value detector
5 receiving the audio signals from the second microphone.

1 3. The system according to Claim 2, further comprising an indicator utilizing the
2 error signal to generate a indication of the acoustic pick-up device being positioned
3 differently than intended.

1 4. The system according to Claim 3, wherein the indicator comprises a visual
2 indicator.

1 5. The system according to Claim 4, wherein the visual indicator comprises a
2 light emitting diode disposed proximate to the pick-up device.

1 6. The system according to Claim 4, wherein the visual indicator comprises a
2 light emitting diode disposed on the pick-up device.

1 7. The system according to Claim 4, wherein the visual indicator comprises a
2 light emitting diode that is a plug-in accessory for the pick-up device.

1 8. The system according to Claim 4, further comprising a headset coupled to the
2 acoustic pick-up device, wherein the visual indicator comprises a light emitting diode
3 disposed on the headset.

1 9. The system according to Claim 4, further comprising a headset coupled to the
2 acoustic pick-up device, wherein the visual indicator comprises a light emitting diode that
3 is a plug-in accessory for the headset.

1 10. The system according to Claim 4, further comprising a handset coupled to the
2 acoustic pick-up device, wherein the visual indicator comprises a light emitting diode
3 disposed on the handset.

1 11. The system according to Claim 4, further comprising a handset coupled to the
2 acoustic pick-up device, wherein the visual indicator comprises a light emitting diode that
3 is a plug-in accessory for the handset.

1 12. The system according to Claim 3, wherein the indicator comprises an audio
2 indicator.

1 13. The system according to Claim 12, wherein the audio indicator comprises a
2 tone generator positioned on the pick-up device, and a speaker coupled to the tone
3 generator.

1 14. The system according to Claim 12, wherein the audio indicator comprises a
2 tone generator that is a plug-in accessory for the pick-up device.

1 15. The system according to Claim 12, further comprising a headset coupled to
2 the acoustic pick-up device, wherein the audio indicator comprises a tone generator
3 disposed on the headset.

1 16. The system according to Claim 12, further comprising a headset coupled to
2 the acoustic pick-up device, wherein the audio indicator comprises a tone generator that
3 is a plug-in accessory for the headset.

1 17. The system according to Claim 12, further comprising a handset coupled to
2 the acoustic pick-up device, wherein the audio indicator comprises a tone generator
3 disposed on the handset.

1 18. The system according to Claim 12, further comprising a handset coupled to
2 the acoustic pick-up device, wherein the audio indicator comprises a tone generator that
3 is a plug-in accessory for the handset.

1 19. The system according to Claim 3, wherein the indicator comprises a sensory
2 indicator.

1 20. The system according to Claim 19, wherein the sensory indicator comprises a
2 motion generator disposed on the pick-up device.

1 21. The system according to Claim 19, wherein the sensory indicator comprises a
2 motion generator that is a plug-in accessory for the pick-up device.

1 22. The system according to Claim 19, further comprising a headset coupled to
2 the acoustic pick-up device, wherein the sensory indicator comprises a motion generator
3 disposed on the headset.

0985472-051401
FOI 50 227586

1 23. The system according to Claim 19, further comprising a headset coupled to
2 the acoustic pick-up device, wherein the sensory indicator comprises a motion generator
3 that is a plug-in accessory for the headset.

1 24. The system according to Claim 19, further comprising a handset coupled to
2 the acoustic pick-up device, wherein the sensory indicator comprises a motion generator
3 disposed on the handset.

1 25. The system according to Claim 19, further comprising a handset coupled to
2 the acoustic pick-up device, wherein the sensory indicator comprises a motion generator
3 that is a plug-in accessory for the handset.

1 26. The system according to Claim 1, wherein the error signal is determined after
2 the audio signals are received by the position estimation circuit.

1 27. The system according to Claim 1, wherein the first microphone and the
2 second microphone are both omnidirectional microphones.

1 28. The system according to Claim 27, further comprising a noise canceling
2 microphone signal generated by a difference between the audio signals received from the
3 first microphone and the audio signals received from the second microphone.

1 29. The system according to Claim 1, wherein the position estimation circuit
2 detects the acoustic pick-up device being positioned differently than intended by using a

1 36. The system according to Claim 1, wherein the controller includes:
2 a programmable phase shift network adapted to produce a range of phase shifts in
3 the audio signals from the second microphone; and
4 a device producing a combined signal based on those signals being phase shifted
5 and on the audio signals received from the first microphone, the device being
6 further capable of transferring the combined signal to the output.

1 37. The system according to Claim 36, wherein the device comprises a
2 differential amplifier.

1 38. The system according to Claim 1, wherein the first microphone is disposed
2 closer to the desired acoustic source than the second microphone.

1 39. The system according to Claim 1, wherein the position estimation circuit
2 comprises:
3 a device determining whether the desired acoustic source is operational; and
4 coupled to the device, a sensor determining that the acoustic pick-up device is
5 positioned differently than intended.

1 40. The system according to Claim 39, wherein the audio signals from at least
2 one of the first microphone and the second microphone are provided to the output when
3 the acoustic source is operational and when the sensor determines that the acoustic pick-
4 up device is positioned differently than intended according to a predetermined threshold
5 that is exceeded.

1 41. The system according to Claim 39, wherein the position estimation circuit
2 further comprises:
3 a second circuit determining progressive levels of the acoustic pick-up device
4 being positioned differently than intended with respect to the desired acoustic
5 source; and
6 a third circuit determining a corresponding phase shift based on a particular one
7 of the progressive levels determined, said corresponding phase shift being
8 introduced with the audio signals received from the second microphone to
9 produce delayed signals, the delayed signals being subtracted from the audio
10 signals received from the first microphone to provide the output.

1 42. The system according to Claim 39, wherein second circuit comprises a multi-
2 level comparator, and the third circuit comprises a state machine coupled to the multi-
3 level comparator.

1 43. The system according to Claim 39, wherein the corresponding phase shift
2 causes a directional response of the second microphone to have a response pattern
3 including one of a figure eight pattern, a cardioid pattern, a hypercardioid pattern, and an
4 omnidirectional pattern.

1 44. The system according to Claim 1, further comprising a headset having the
2 first microphone and the second microphone disposed thereon, wherein the first
3 microphone is disposed closer to the desired acoustic source than the second microphone.

1 45. The system according to Claim 1, further comprising a handset having the
2 first microphone and the second microphone disposed thereon, wherein the first
3 microphone is closer to the desired acoustic source than the second microphone.

1 46. The system according to Claim 1, wherein the position estimation circuit
2 further includes a position threshold circuit coupled to the first circuit, the position
3 threshold circuit associating a gain with the audio signals from the second microphone
4 for comparison with the audio signals from the first microphone.

1 47. The system according to Claim 46, wherein the position estimation circuit
2 further includes a pulse stretching circuit in electrical communication with the position
3 threshold circuit, the pulse stretching circuit maintaining the error signal for a period of
4 time to enable the audio signals from at least one of the first microphone and the second
5 microphone to be provided to the output.

1 48. The system according to Claim 47, wherein the pulse stretching circuit
2 comprises a reset circuit causing the error signal to enable the audio signals from at least
3 one of the first microphone and the second microphone to be provided to the output.

1 49. A headset, comprising:
2 a supporting device adapted to be secured to a head of a user;
3 a boom coupled to the supporting device and disposed proximate a desired
4 acoustic source comprising a mouth of the user generating acoustic signals;

5 an acoustic pick-up device coupled to the boom and having a first microphone
6 disposed at a first distance from a desired acoustic source, and a second
7 microphone disposed at a second distance from the desired acoustic source,
8 each of the first microphone and the second microphone
9 receiving the acoustic signals, and
10 in response, transducing the acoustic signals into audio signals;
11 a position estimation circuit coupled to receive the audio signals from the first
12 microphone and the second microphone, and adapted to produce therefrom an
13 error signal representing an estimate of the acoustic pick-up device being
14 positioned differently than intended with respect to the desired acoustic
15 source, the position estimation circuit including a first circuit providing an
16 average of corresponding magnitudes for the audio signals received from the
17 first microphone and the second microphone to produce the error signal; and
18 a controller using the error signal to compensate for the acoustic pick-up device
19 being positioned differently than intended by providing the audio signals
20 from at least one of the first microphone and the second microphone to an
21 output.

1 50. The system according to Claim 49, wherein the first circuit comprises a first
2 absolute value detector and a first envelope detector receiving the audio signals from the
3 first microphone, and a second absolute value detector and a second envelope detector
4 receiving the audio signals from the second microphone.

1 51. A system for controlling a directional response of at least one of a first
2 microphone and a second microphone, the system comprising:
3 first microphone means disposed at a first distance from a desired acoustic source;
4 second microphone means disposed at a second distance from the desired acoustic
5 source, each of the first microphone means and the second microphone
6 means receiving acoustic signals generated from the desired acoustic source,
7 and in response thereto, transducing the acoustic signals into audio signals;
8 position estimation means coupled to receive the audio signals from the first and
9 second microphone means, the position estimation means being adapted to
10 produce therefrom an error signal representing an estimate of the first and
11 second microphone means being positioned differently than intended with
12 respect to the desired acoustic source, the position estimation means
13 including means for averaging corresponding magnitudes for the audio
14 signals received from each of the first and second microphone means to
15 produce the error signal; and
16 control means using the error signal to compensate for the first and second
17 microphone means being positioned differently than intended by providing
18 the audio signals from at least one of the first and second microphone means
19 to an output.

1 52. The system according to Claim 51, wherein said control means adjusts a polar
2 pattern of the audio signals received from the first and second microphone means to
3 provide the audio signals to the output.

1 53. The system according to Claim 51, wherein the audio signals provided to the
2 output include noise canceling from a combination of the audio signals from both the first
3 and second microphones.

1 54. A method of controlling a directional response of at least one of a first and
2 second microphones, the method comprising:
3 receiving acoustic signals generated by a desired acoustic source at a first
4 microphone;
5 receiving the acoustic signals at a second microphone;
6 in response, the first and second microphones each transducing the acoustic
7 signals respectively received into audio signals;
8 { determining an average of corresponding magnitudes of the audio signals for each
9 { of the first microphone and the second microphone;
10 detecting an error signal amongst the audio signals, the error signal representing
11 an estimate of the average determined for each of the first and second
12 microphones being positioned differently than intended with respect to the
13 desired acoustic source;
14 using the error signal to select the directional response corresponding to at least
15 one of the first and second microphones in order to compensate for the first
16 and second microphones being positioned differently than intended; and
17 providing the audio signals associated with the directional response selected to an
18 output.

1 55. The method according to Claim 54, wherein detecting an error signal
2 comprises determining a ratio of the audio signals associated with the first microphone
3 with the audio signals associated with the second microphone.

1 56. The method according to Claim 55, further comprising:
2 in response to the ratio determined, providing noise canceling microphone signals
3 to the output.

1 57. The method according to Claim 54, wherein the audio signals provided to the
2 output are a result of noise canceling determined by generating a difference between the
3 audio signals associated with the first microphone and the audio signals associated with
4 the second microphone.

1 58. The method according to Claim 54, further comprising
2 activating an indicator in response to receiving the error signal to indicate the first
3 and second microphones being positioned differently than intended with
4 respect to the desired acoustic source.

1 59. The method according to Claim 54, wherein the first microphone comprises
2 omnidirectional microphone and the second microphone comprises a directional
3 microphone.

1 60. The method according to Claim 54, wherein the first and second microphones
2 each comprises an omnidirectional microphone.

1 61. The method according to Claim 54, further comprising:
2 determining progressive levels of the first and second microphones being
3 positioned differently than intended with respect to the desired acoustic
4 source;
5 determining a corresponding phase shift based on a particular one of the
6 progressive levels associated with the error;
7 introducing the corresponding phase shift with the audio signals associated with
8 the second microphone to produce delayed signals;
9 providing at the output the delayed signals combined with the audio signals
10 associated with the first microphone.

1 62. The method according to Claim 54, wherein the first microphone is disposed
2 closer to the desired acoustic source than the second microphone.

1 63. The method according to Claim 54, wherein the directional response includes
2 one of a figure eight pattern, a cardioid pattern, a hypercardioid pattern, and an
3 omnidirectional pattern.

1 64. A method of sensing and compensating for an error, the method comprising:
2 receiving acoustic signals generated by a desired acoustic source at a first
3 microphone;
4 receiving the acoustic signals at a second microphone;
5 in response, the first and second microphones each transducing the acoustic
6 signals respectively received into audio signals;

